Preliminary Conceptualization of Shared Mental Models in a Project Team Domain

TC3 Workshop:

Cognitive Elements of Effective Collaboration

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Overview

- Definitions
- Background
- Preliminary Conceptualization
- Contributions
- Future Directions

Cross-Functional Project Teams

A collection of
two or more individuals,
representing different functional areas,
assembled to work on
a time-limited, non-repetitive assignment.

Source: Cohen and Bailey, 1997

Taskwork vs. Teamwork

- Taskwork

  The functional job behaviors required to accomplish the assigned task.

- Teamwork

  The multitude of processes required to maintain the team such as cooperation, communication, interpersonal relationships.

Source: McIntyre and Salas, 1995

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Shared Mental Models by Any Other Name . . .

- Cause maps
- Collective mind
- Schemas
- Shared cognition
- Sociocognition
- Team knowledge

Background

- Mental models are

  used to describe, explain, and predict surroundings (Rouse and Morris, 1986) . . .

  . . . thereby aiding in the reduction of uncertainty (Klimoski and Mohammed, 1994) . . .

  . . . by "running" possible scenarios, using the most salient pieces of information, to ascertain potential outcomes (Cannon-Bowers, Salas, and Converse, 1993).

- Shared Mental Models are cognitively unified individual-level mental models held by team members.

Shared Mental Models Defined

- **Shared Mental Models**
  - **“Knowledge structures held by members of a team that enable them to form accurate explanations and expectations for the task, and in turn, to coordinate their actions and adapt their behavior to demands of the task and other team members” (Cannon-Bowers, Salas, & Converse, 1993, p. 228).**
- **Schemas**
  - **“Built-up repertoires of tacit knowledge that are used to impose structure upon, and impart meaning to, otherwise ambiguous social and situational information to facilitate understanding” (Gioia, 1986, p. 56).**
- **Interpretive schemes**
  - **“. . . shared, fundamental (though often implicit) assumptions about why events happen as they do and how people are to act in different situations” (Bartunek, 1984, p. 355).**

Shared Mental Models

Mental representations
based on
past experiences and inherent knowledge
that
aid individuals in determining the best course of future action.

Expected Outcomes

- Better task performance (e.g., Entin and Serfaty, 1999; Walsh, Henderson, and Deighton, 1988)
- Better team processes that lead to better task performance (e.g., Ensley and Pearce, 2001; Mathieu, Heffner, Goodwin, Salas, and Cannon-Bowers, 2000)
- Better motivational outcomes

Current Limitations in the Field

- No consensus regarding:
  - Identification of what should be shared
  - Definition of shared
  - Measurement of shared mental models
  - Effects of shared mental models on team outcomes

Source: Cannon-Bowers and Salas, 2001

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Preliminary Conceptualization

- Two dimensional framework
  - Shared mental models' contents
  - Information processing phases

Shared Mental Models' Contents

- Multiple models have been identified (e.g., Mathieu, Heffner, Goodwin, Salas, and Cannon-Bowers, 2000)
- Determinants of shared mental models (e.g., Kraiger and Wenzel, 1997)

Shared Mental Models' Contents

Determinants

- Individual
- Team
- Organization
- Environment

Models

- Team Membership
- Project (taskwork)
- Interaction (teamwork)
- Climate
- Context

Preliminary Conceptualization

- Two dimensional framework
  - Shared mental models content
  - Information processing phases

Information Processing

- Individual level (e.g., Shroeder, Driver, and Streufert, 1967)
- Group level (e.g., Gruenfeld and Hollingshead, 1993; Hinsz, Tindale, and Vollrath, 1997)

Information Processing

- Differentiation
- Integration

Preliminary Conceptualization

	Team Members	Project	Team Interaction	Climate	Context
Differentiation					
Integration					

Information Processing

- Differentiation

  The identification of multiple perspectives

- Integration

Differentiation As a Transactive Memory System

- Transactive memory is a cooperative memory system for encoding, storing, and retrieving information (Wegner, 1987, 1995).
- Transactive memory research has typically examined information about expertise.
- Each shared mental model will require its own transactive memory directory.

Information Processing

- Differentiation

  The identification of multiple perspectives

- Integration

  The reconciliation of the various perspectives into functioning mental representations

Integration

- High levels of integration can limit the scope of the information considered by a team (e.g., Corner, Kinicki, and Keats, 1994)
- Integration levels
  - are dependent upon shared mental model content
  - determine the requisite sharing level

Sharing

- To have in common
- To divide

Sources: Cooke, Salas, Cannon-Bowers, and Stout, 2000; Klimoski and Mohammed, 1994; Mohammed and Dunnville, 2001

Integration and Sharing

Low Integration ⟷ **High Integration**

To have in common:

Compatible — **Overlapping** — **Identical**

To divide:

Single Individual ⟷ **Equitably Distributed**

Shared Mental Models' Corresponding Sharing Levels

Models	Sharing Level
Team Membership	Compatible
Project (goals)	Identical
Project (work content)	Distributed
Interaction	Overlapping
Climate	Overlapping
Context	Overlapping

Preliminary Conceptualization Sample Operationalizations

	Team Membership	Project	Team Interaction
Differentiation	**Functional Diversity**	**Nature of the Project**	**Interdependence**
Integration	**Membership Adequacy**	**Project Goals**	**Team Processes**

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Contributions

- Practitioners
  - Guidance for team development
- Academicians
  - Framework for use in future empirical work

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Future Directions

- Conceptualization Finalization and Field Validation
- Measurement Instrument Development and Validation
- Application Development
  - Exercises for Virtual Teams
  - Diagnostic Tools for Teams
  - Tests of Impact on Team Performance